YELLOWSTONE AND SNAKE RIVER CUTTHROAT TROUT

SUBSPECIES DISTRIBUTION MAPPING

National Park Service
2004 Annual Report and Summary of Accomplishments

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Location: Snake River headwaters upstream of Palisades Reservoir, Wyoming.
Goal: Document the geographic distributions of Yellowstone cutthroat trout, *Oncorhynchus clarkii bouvieri* (YSC), and finespotted Snake River cutthroat trout, *Oncorhynchus clarkii* subsp. (SRC), in the Snake River headwaters of Wyoming.
Objectives: 1) Systematically sample all fish bearing streams in the Snake River headwaters upstream of Palisades Reservoir, Wyoming on lands administered by federal land management agencies;
2) Document the distributions of Yellowstone and Snake River cutthroat trout and, provide a comprehensive survey of game and non-game fishes;
3) Spatially display (map) geographic distribution of cutthroat trout subspecies and areas of subspecies overlap using a Geographic Information System (GIS) with annual updates, as well as final map production; and
4) Provide land and resource management agencies with information to facilitate informed conservation of aquatic biota.

2004 Accomplishments: A total of 332.6 km (206.7 mi) on 40 streams were surveyed on federal lands above Jackson Lake dam. The majority of these streams (261.8 km on 28 streams) flow within the three National Park Service (NPS) units, or cross the administrative boundaries with the US Forest Service (Table 6). One-hundred-seventy-eight kilometers of the stream length surveyed was on NPS lands; 101.1 km on 20 streams were within Grand Teton National Park (GTNP), 41.2 km and 5 streams were in the John D Rockefeller Memorial Parkway (JDR), and 35.6 km on 4 streams were within Yellowstone National Park (YNP; Table 6). The remaining 89.3 km surveyed were on 10 streams in the Bridger-Teton National Forest (BTNF). Of the 24 streams within GTNP and the JDR, two streams could not be sampled due to too low of flow, and 4 small tributaries were not surveyed due to being located upstream of terminated surveys. Summaries of the length and number of streams occupied by each fish species are provided in Tables 6 and 7, and the companion EXCEL file (CD – *fy04_nps_survey_summary.xls*).

2004 Cost: 2004 cost per kilometer for stream surveys included crews, volunteers, data entry, reporting, and purchase of necessary sampling and field equipment.

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NPS Summary: A total of 405.0 km on 53 streams were surveyed between 2002 and 2004 (Table 8) on the three NPS units. Most of the streams were in GTNP (251.3 km on 43 streams). The BTNF fisheries crew also surveyed 5 streams (41.3 km) in the JDR, and 4 streams (35.6 km) in YNP; an additional 79.7 km on 5 streams within YNP were surveyed by the YNP fisheries crew in 2004 and are included in this summary as the data has been incorporated into the data base.

Across the three NPS units, our surveys indicate similar stream occupancy for all trout as compared to the broader study area, with approximately 73% of the perennial stream length occupied, and cutthroat trout being present in 88% of the perennial stream length occupied by trout (Tables 8 and 9). While presence of Yellowstone cutthroat trout was similar at 21% of stream length, presence of finespotted Snake River cutthroat trout declined to 21%; both YSC and SRC were present together in an additional 6% of stream length. Unidentifiable cutthroat trout (i.e., fish exhibiting intermediate or anomalous spotting that could not be identified as either YSC or SRC) occupied 39% of stream length (17 streams). Most of this shift to fewer observed SRC, and increased occurrence of intermediate spotting occurred in tributaries upstream of the Spread Cr drainage.

Rainbow trout or rainbow-cutthroat trout hybrids (RXC) were observed in the Gros Ventre drainage, with RXC present in 4.0 km of the Gros Ventre R above the Town of Kelly within GTNP. A more complete discussion on incidence and locations of RXC is provided in the final report to the WGFD on the development of genetic markers.

Brook trout presence was higher within the NPS units than that observed throughout the study area, with approximately 17% of the perennial stream length occupied by BKT (Tables 8 and 9). Brook trout appear to have displaced cutthroat trout from 3 small streams within GTNP that comprise about 1.8% of the total stream length occupied by trout (Table 9). Similarly, BKT were present only with unidentifiable juvenile cutthroat trout (<150 mm) in 8 streams within GTNP and the JDR. While those streams represent only 6.8% of the stream length occupied by trout in the three NPS units, they comprise nearly 39% of the stream length with BKT present. On a more optimistic note, 2 of the streams are extensive in length (Glade Cr and Lizard Cr), have abundant juvenile cutthroat trout, and BKT were present in very low numbers.

Brown trout (BNT) were present in 6 streams within the three NPS units, and have not been observed elsewhere in the study area. All the streams were connected to Jackson Lake, and represent 5.2% of the length occupied by trout. There were no streams with only BNT present, 2 of the 6 streams had only juvenile cutthroat trout, and 1 of the latter was also occupied by BKT.

Project Summary: Our original goal was to document the geographic distributions of Yellowstone and Snake River cutthroat trout over 5 years in an estimated 2,400 km (1,500 mi) of fish bearing streams between Palisades Reservoir and Jackson Lake, Wyoming. We have completed surveys within approximately 2,632 km (1,635 mi) of 579 streams in 7-years (Table 1). Most of the Buffalo Fork River drainage remains to be surveyed. Our original concerns regarding project feasibility have been addressed; these related specifically to sampling logistics, timing of stream occupancy by fishes, capture technique, and cutthroat trout identification. Though our original intent was to survey only on National Forest System lands, the availability of funding from the Greater Yellowstone Coordinating Committee allowed completion of surveys on the National Elk Refuge (NER) and GTNP. Additional inventory funding came from the National Park Service – Greater Yellowstone Network during 2004, that allowed us to survey the streams in the JDR and YNP above Jackson Lake Dam, and the National Park Service Cooperative Conservation Initiative in 2002 – were instrumental in initiating surveys in GTNP.

Sampling results to date have supported our systematic approach as opposed to a random, or stratified random sample scheme. When sampling across an environmental gradient, or the logistical demands or cost of systematic sampling approaches that of random sampling, systematic sampling may be pursued. This is particularly applicable in the case of Yellowstone and Snake River cutthroat trout in the Snake River headwaters, where we have documented an elevation gradient, with Snake River cutthroat trout present throughout the occupied length of streams, Yellowstone cutthroat trout occupying the upper reaches of streams, and an area of phenotypic overlap generally being observed at mid-elevations. We have also captured cutthroat trout that exhibits spotting and coloration similar to Bonneville cutthroat trout, *O. c. utah*, in streams draining the Teton Mountains and with no documentation of historical stocking.

Our surveys indicate trout occupy approximately 73% of the perennial stream length sampled, and cutthroat trout are present in 91% of the perennial stream length occupied by trout (Table 2). Yellowstone cutthroat trout were present in approximately 19% of stream length, where as Snake River cutthroat trout were present in 54% (Table 3); unidentifiable juvenile cutthroat trout occupied 67 streams (4.3% of the total stream length occupied by trout; Table 4). Yellowstone cutthroat trout occur almost exclusively in sympatry with Snake River cutthroat trout. Allopatric Yellowstone cutthroat trout were present in 10 streams (12.15 km or <1% of the total stream length occupied by trout).

In addition, our systematic sampling scheme has resulted in the documentation of the introduction of fathead minnow, *Pimephalas promelas*, in the Snake River Canyon, the first recorded collection of leatherside chub, *Snyderichthys copei*, in GTNP and the BTNF since the 1950's, and confirmation of the spatial extent of non-native trout (e.g., brook trout and rainbow trout). Furthermore, we have documented range expansion of non-native trout, as well as their natural extirpation.

Rainbow trout were captured in <1.0 km of 1 stream throughout the survey area (Table 5), though rainbow-cutthroat trout hybrids (RXC) were present in approximately 12.5 km

(<1% of the total stream length occupied by trout) of 3 streams (Tables 2 and 5); neither rainbow trout or rainbow-cutthroat hybrids are known to have displaced cutthroat trout from a stream within the surveyed area. This suggests that hybridization is largely limited to those locales previously suspected of harboring RBT or RXC, the main exception being a single fish captured in the Hoback River. Also, the RXC captured upstream of Lower Slide Lake in Crystal Creek and the Gros Ventre River were the first documented hybrid trout being present above the lake and indicate a greater range in the Gros Ventre drainage than was previously known.

Brook trout were present in approximately 13% of the perennial stream length occupied by trout (Tables 2 and 4). Brook trout have displaced cutthroat trout from 14 streams that comprise 1.3% of the total stream length occupied by trout (Table 5). Ten of the 14 streams are tributaries to the Snake River. Four of these streams are located in GTNP, 3 cross the BTNF and NER boundary (two of which have reaches that flow across private land), 2 are located on the BTNF, and the remaining 1 traverses BTNF and private land (Table 5). An additional 4 streams in GTNP and 2 on the BTNF were occupied only by brook trout and unidentifiable juvenile cutthroat trout.

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Table 1 Summary by river drainage for numbers of streams and stream reaches, and stream length (km) surveyed for cutthroat trout presence/absence between 1998 and 2004 in the Snake River headwaters of northwest Wyoming. River drainages are listed as they flow into the Snake River proceeding upstream from Palisades Reservoir.

Drainage	Streams[1]	Reaches	Length
Salt River	57	122	116.0
Snake River [2]	199	1,131	1,051.6
Greys River	101	676	500.5
Hoback River	86	391	377.2
Gros Ventre River	135	610	555.5
Buffalo Fork River [3]	1	16	32.0
Total [4]	579	2,946	2,632.8

[1] Includes main stem and tributaries unless otherwise noted.
[2] Largely tributaries; 24 km surveyed on main stem Snake River between Palisades Reservoir and Jackson Lake dam.
[3] 32 km of Buffalo Fork River surveyed between Snake River confluence and bridge on Forest Road 30050.
[4] Total surveyed within 4,124 reaches identified in 3,472 km on 631 streams. Survey totals are lower due to segments of streams on private lands, stream segments not sampled due to diversion of flows for irrigation or subsurface flow, or segments otherwise deemed too hazardous to sample due to gradient or water depth.

Table 2 Number of streams with cutthroat, brook, and rainbow trout present and the stream length (km) occupied, based on presence/absence surveys between 1998 and 2004 in the Snake River headwaters, Wyoming.

	Cutthroat Trout [1 2]		Brook Trout [2]		Rainbow Trout [2]		All Trout	
Drainage	Streams	Length	Streams	Length	Streams	Length	Streams	Length
Salt River [3]	17	67.9	7	28.2	0	0	17	78.5
Snake River [3]	117	679.9	51	88.4	0	0	127	767.5
Greys River	83	363.6	8	25.7	1	0.83	84	370.8
Hoback River [4]	47	247.3	8	38.5	1	2.50	49	267.1
Gros Ventre River [4]	78	384.4	23	72.2	2	10.0	79	414.1
Buffalo Fork River [5]	1	24.0	-	-	-	-	1	24.0
Total	343	1,767.1	97	253.0	4	13.3	357	1,922.0

[1] Includes YSC, SRC, and unidentified juvenile (<150 mm) or adult (≥150 mm) cutthroat trout.
[2] Occupied stream length is total whether allopatric or in sympatry with other species given.
[3] No rainbow or rainbow-cutthroat hybrids were captured.
[4] Only rainbow-cutthroat trout hybrids were captured.
[5] A "-" indicates not enough of drainage was sampled to enter values.

Table 3 Presence of Yellowstone cutthroat trout and Snake River cutthroat trout in streams surveyed, and stream length (km) occupied in the Snake River headwaters, Wyoming.

	Yellowstone Cutthroat Trout		Snake River Cutthroat Trout		Yellowstone and Snake River Cutthroat trout	
Drainage	Streams	Length	Streams	Length	Streams	Length
Salt River	5	20.9	8	41.4	3	12.3
Snake River	54	222.5	57	217.0	26	49.1
Greys River	18	25.2	70	261.7	18	17.8
Hoback River	12	21.2	36	189.3	9	16.0
Gros Ventre River	22	69.6	61	317.1	20	53.6
Buffalo Fork River	1	6.0	1	24.0	1	6.0
Total	112	365.4	233	1,050.5	77	154.8

Table 4 Presence of cutthroat trout <150 mm and ≥150 mm, and sympatric brook trout, in streams surveyed in the Snake River headwaters, Wyoming. Number of streams and length of stream (km) given are those where no Yellowstone or Snake River cutthroat were identified.

	Cutthroat Trout <150 mm		Cutthroat Trout ≥150 mm		Brook Trout and Cutthroat trout	
Drainage	Streams	Length	Streams	Length	Streams	Length
Salt River[1]	6	5.1	3	0.90	1	0.45
Snake River[2]	31	49.9	8	12.2	16	12.9
Greys River[3]	11	10.7	3	1.10	0	0.00
Hoback River[3]	6	6.0	3	2.10	1	0.40
Gros Ventre River[1]	13	10.4	5	5.60	4	2.95
Buffalo Fork River[4]	-	-	-	-	-	-
Total	67	82.1	22	21.9	22	16.7

[1] Cutthroat trout <150 mm and ≥ 150 mm were captured in two streams.
[2] Cutthroat trout <150 mm and ≥ 150 mm were captured in seven streams.
[3] Cutthroat trout <150 mm and ≥ 150 mm were captured in one stream.
[4] Not enough of drainage surveyed to enter values.

Table 5 Number of streams and length of stream (km) occupied only by rainbow trout or brook trout, and the number and length of stream with sympatric Yellowstone cutthroat trout or Snake River cutthroat trout, as indicated by presence/absence surveys in the Snake River headwaters, Wyoming.

	Rainbow Trout		Rainbow and Cutthroat Trout		Brook Trout		Brook Trout and Cutthroat Trout	
Drainage	Streams	Length	Streams	Length	Streams	Length	Streams	Length
Salt River[1]	0	0	0	0	0	0	6	19.1
Snake River[1]	0	0	0	0	10	16.5	25	42.5
Greys River	1	0.83	0	0	1	2.00	7	18.5
Hoback River[2]	0	0	1	2.50	2	6.40	5	17.3
Gros Ventre River[2]	0	0	2	10.0	1	0.45	18	41.6
Buffalo Fork River[3]	-	-	-	-	-	-	-	-
Total	1	0.83	3	12.5	14	25.4	61	139.0

[1] No rainbow or rainbow-cutthroat trout hybrids were captured.
[2] Only rainbow-cutthroat trout hybrids were captured.
[3] A "-" indicates not enough of drainage surveyed to enter values.

Table 6 Summary of fish distribution surveys cooperatively funded by the Greater Yellowstone Coordinating Committee, and National Park Service – Greater Yellowstone Network in 2004, by administrative unit (BTNF – Bridger-Teton NF; GNTP – Grand Teton NP; JDR – John D Rockefeller Memorial Parkway; YNP – Yellowstone NP). Streams and lengths are those that specifically flow within National Pak Service units, or cross administrative boundaries, and exclude streams flowing entirely on National Forest System lands.

	Survey Length (km) by Administrative Unit				Totals		
Stream	BTNF	GTNP	JDR	YNP	km[4]	mi	Cost[5]
Arizona Cr	10.5	5.5	0.0	0.0	16.0	9.9	3840.00
Bailey Cr	6.7	1.8	0.0	0.0	8.5	5.3	2040.00
Berry Cr	0.0	20.0	0.0	0.0	20.0	12.4	4800.00
Christian Cr	0.0	2.8	0.0	0.0	2.8	1.7	660.00
Colter Canyon	0.0	1.2	0.0	0.0	1.2	0.7	288.00
Coulter Cr	17.5	0.0	0.0	1.5	19.0	11.8	4560.00
Dime Cr	0.9	0.0	4.2	0.0	5.1	3.2	1230.00
Glade Cr	0.0	0.0	14.0	0.0	14.0	8.7	3360.00
Harebell Cr	2.3	0.0	0.0	7.7	10.0	6.2	2400.00
Hechtman Creek	0.0	5.9	0.0	0.0	5.9	3.7	1416.00
Leigh Canyon	0.0	6.6	0.0	0.0	6.6	4.1	2376.00
Lizard Cr	0.0	5.4	0.0	0.0	5.4	3.4	1296.00
Lost Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Moose Creek	0.0	8.0	0.0	0.0	8.0	5.0	1920.00
Moran Cr	0.0	2.3	0.0	0.0	2.3	1.4	540.00
Moran Cr, N Fk[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Moran Cr, S Fk[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Nickel Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.00
North Moran Cr	0.0	5.0	0.0	0.0	5.0	3.1	1200.00
North Moran Cr, N Fk[8]	0.0	0.2	0.0	0.0	0.2	0.1	48.00
Owl Cr	0.0	9.0	0.0	0.0	9.0	5.6	2160.00
Pilgrim Cr	14.4	9.6	0.0	0.0	24.0	14.9	5760.00
Pilgrim Cr, E Fk	14.5	1.7	0.0	0.0	16.2	10.1	3888.00
Plateau Cr	1.8	0.0	0.0	5.2	7.0	4.3	1680.00
Polecat Cr	0.0	0.0	5.6	18.4	24.0	14.9	5760.00
Quarter Cr	0.0	0.0	3.4	0.0	3.4	2.1	816.00
Second Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Snake R[9,10]	11.4	0.0	14.0	0.0	39.4	24.5	1905.00
Spring Cr	0.0	5.0	0.0	0.0	5.0	3.1	1200.00
Third Cr	0.0	3.5	0.0	0.0	3.5	2.2	840.00

Stream	Survey Length (km) by Administrative Unit				Totals		
	BTNF	GTNP	JDR	YNP	km[4]	mi	Cost[5]
Topping Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Unnamed Tributary 17 (Arizona Lake)	3.9	0.9	0.0	0.0	4.8	3.0	1152.00
Unnamed Tributary 18 (Bearpaw Lake)	0.0	2.2	0.0	0.0	2.2	1.4	528.00
Unnamed Tributary 19 (Dudley Lake)[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Waterfalls Canyon	0.0	4.6	0.0	0.0	4.6	2.8	1092.00
Totals	83.9	101.1	41.4	32.8	275.8	171.4	$56,904.00
Percent	30.3	36.6	13.0	7.4			
Number of Streams	10	20	5	4	28		

[1] CUT=unidentifiable cutthroat trout.
[2] CUT<150mm include young-of-the-year (<80mm), 1^+ (80-100mm), or fish >100mm that retain parr marks or lack distinct spotting pattern.
[3] CUT>150mm with spotting pattern that cannot be identified as YSC or SRC.
[4] Surveyed stream lengths do not include private lands. This summary includes only stream surveys funded with GYCC grants.
[5] Calculated at $240/km ($390/mi) for backpack sampling, and $75/km ($120/mi) for boat sampling.
[6] Includes hook-n-line sampling.
[7] Not sampled due to low flow or stream dry.
[8] Not sampled due to being upstream of 3 fishless sample reaches or habitat deemed unable to support fish.
[9] RXC captured by WGFD during 2004 abundance sampling near confluence of Gros Ventre R.
[10] An additional 14 km sampled by WGFD during 2004 abundance sampling on either private or BLM lands.

Table 7 Summary by stream of fish species distribution surveys cooperatively funded by the Greater Yellowstone Coordinating Committee, and National Park Service – Greater Yellowstone Network, during 2002. See Table 10 for explanations of species abbreviations.

	Species[1] Presence (km)									
Streams Surveyed	CUT <150mm[2]	CUT ≥150mm[3]	SRC	YSC	BKT	BNT	GLD	LAT	RBT	RXC
Arizona Cr	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bailey Cr	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Berry Cr	6.0	8.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
Christian Cr	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Colter Canyon	0.6	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0
Coulter Cr	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dime Cr[9]	2.8	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0
Glade Cr[9]	4.2	0.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0
Harebell Cr[9]	7.7	1.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0
Hechtman Cr	4.5	3.6	0.9	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Leigh Canyon	2.4	2.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lizard Cr	3.6	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0
Lost Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moose Cr	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moran Cr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moran Cr, N Fk[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moran Cr, S Fk[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Streams Surveyed	Species[1] Presence (km)									
	CUT <150mm[2]	CUT ≥150mm[3]	SRC	YSC	BKT	BNT	GLD	LAT	RBT	RXC
Nickel Cr[7,9]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Moran Cr	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
North Moran Cr, N FK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Owl Cr	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pilgrim Cr	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pilgrim Cr, E Fk	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plateau Cr[9]	1.4	3.8	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Polecat Cr[9]	10.0	8.0	0.0	6.0	2.0	8.0	0.0	0.0	0.0	0.0
Quarter Cr[9]	1.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Second Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snake R	6.0	12.0	14.0	10.0	2.0	12.0	0.0	0.0	0.0	0.0
Spring Cr	0.0	0.0	0.3	0.0	2.1	0.0	0.0	0.0	0.0	0.0
Third Cr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Topping Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 17 (Arizona Lake)	0.9	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 18 (Bearpaw Lake)	1.2	0.0	0.4	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Unnamed Tributary 19 (Dudley Lake)[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

	Species[1] Presence (km)									
Streams Surveyed	CUT <150mm[2]	CUT ≥150mm[3]	SRC	YSC	BKT	BNT	GLD	LAT	RBT	RXC
Waterfalls Canyon	1.3	1.3	0.0	0.7	2.0	0.7	0.0	0.0	0.0	0.0
Totals;	68.5	39.9	18.3	28.1	17.9	22.9	0.0	4.0	0.0	0.0
Percent	38.1	22.2	10.2	16.0	10.2	13.0	0.0	2.3	0.0	0.0
Number of Streams	22	8	6	9	9	6	0	1	0	0

[1] CUT=unidentifiable cutthroat trout.
[2] CUT<150mm include young-of-the-year (<80mm), 1^{+} (80-100mm), or fish >100mm that retain parr marks or lack distinct spotting pattern.
[3] CUT>150mm with spotting pattern that cannot be identified as YSC or SRC.
[4] Surveyed stream lengths for GTNP (does not include up or downstream reaches surveyed on USFS, State, or private lands).
[5] Calculated at $240/km ($390/mi) for backpack sampling, and $75/km ($120/mi) for boat sampling.
[6] Includes hook-n-line sampling.
[7] Not sampled due to low flow or stream dry.
[8] Not sampled due to being upstream of 3 fishless sample reaches or habitat deemed unable to support fish.
[9] Stream length surveyed includes Grand Teton NP, John D Rockefeller Memorial Parkway, or Yellowstone NP.

Table 8 Summary of fish distribution surveys cooperatively funded by the Greater Yellowstone Coordinating Committee, National Park Service – Greater Yellowstone Network and Cooperative Conservation Initiative, in 2002 - 2004, by administrative unit (BTNF – Bridger-Teton NF; GNTP – Grand Teton NP; JDR – John D Rockefeller Memorial Parkway; YNP – Yellowstone NP). Streams and lengths are those that specifically flow within National Pak Service units, or cross administrative boundaries, and exclude streams flowing entirely on National Forest System lands. Costs vary between years and are not included.

	Survey Length (km) by Administrative Unit				Totals	
Stream	BTNF	GTNP	JDR	YNP	km[4]	mi
Arizona Cr	10.5	5.5	0.0	0.0	16.0	9.9
Bailey Cr	6.7	1.8	0.0	0.0	8.5	5.3
Beaver Cr	0.0	4.2	0.0	0.0	4.2	2.6
Berry Cr	0.0	20.0	0.0	0.0	20.0	12.4
Box Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0
Bradley Cr	0.0	3.1	0.0	0.0	3.1	1.9
Brush Cr	1.5	3.4	0.0	0.0	4.9	3.0
Buffalo Fk[5]	21.5	10.5	0.0	0.0	32.0	19.9
Cascade Cr	0.0	10.0	0.0	0.0	10.0	6.2
Cascade Cr, S Fk	0.0	1.2	0.0	0.0	1.2	0.7
Christian Cr	0.0	2.8	0.0	0.0	2.8	1.7
Colter Canyon	0.0	1.2	0.0	0.0	1.2	0.7
Cottonwood Cr	0.0	10.8	0.0	0.0	10.8	6.7
Coulter Cr	17.5	0.0	0.0	1.5	19.0	11.8
Crooked Cr[10]	0.0	0.0	0.0	11.2	11.2	7.0
Death Canyon	0.0	12.1	0.0	0.0	12.1	7.5
Dime Cr	0.9	0.0	4.2	0.0	5.1	3.2
Ditch Cr	10.1	11.9	0.0	0.0	22.0	13.7
Garnet Canyon	0.0	1.2	0.0	0.0	1.2	0.7
Glacier Gulch	0.0	3.2	0.0	0.0	3.2	2.0
Glade Cr	0.0	0.0	14.0	0.0	14.0	8.7
Granite Cr	0.0	6.5	0.0	0.0	9.6	6.0
M Fk Granite Cr[8]	0.0	0.0	0.0	0.0	0.0	0.0
N Fk Granite Cr[8]	0.0	0.0	0.0	0.0	0.0	0.0
S Fk Granite Cr[8]	0.0	0.0	0.0	0.0	0.0	0.0
Gros Ventre R[5,6]	2.4	16.2	0.0	0.0	18.4	11.4
Hanging Canyon	0.0	1.2	0.0	0.0	1.2	0.7
Harebell Cr	2.3	0.0	0.0	7.7	10.0	6.2
Heart R[10]	0.0	0.0	0.0	14.1	14.1	8.8

Stream	Survey Length (km) by Administrative Unit				Totals	
	BTNF	GTNP	JDR	YNP	km[4]	mi
Hechtman Cr	0.0	5.9	0.0	0.0	5.9	3.7
Lake Cr[6]	0.0	5.8	0.0	0.0	5.8	3.6
Lava Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0
Leigh Canyon	0.0	6.6	0.0	0.0	6.6	4.1
Lizard Cr	0.0	5.4	0.0	0.0	5.4	3.4
Lost Cr (Topping Cr)[7]	0.0	0.0	0.0	0.0	0.0	0.0
Moose Creek	0.0	8.0	0.0	0.0	8.0	5.0
Moran Cr	0.0	2.3	0.0	0.0	2.3	1.4
Moran Cr, N Fk[8]	0.0	0.0	0.0	0.0	0.0	0.0
Moran Cr, S Fk[8]	0.0	0.0	0.0	0.0	0.0	0.0
Nickel Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0
North Moran Cr	0.0	5.0	0.0	0.0	5.0	3.1
North Moran Cr, N Fk[8]	0.0	0.2	0.0	0.0	0.2	0.1
Open Canyon	0.0	6.3	0.0	0.0	6.3	3.9
Owl Cr	0.0	9.0	0.0	0.0	9.0	5.6
Pacific Cr	42.1	6.7	0.0	0.0	48.8	30.3
Paintbrush Canyon	0.0	6.1	0.0	0.0	6.1	3.8
Pilgrim Cr	14.4	9.6	0.0	0.0	24.0	14.9
Pilgrim Cr, E Fk	14.5	1.7	0.0	0.0	16.2	10.1
Plateau Cr[10]	1.8	0.0	0.0	8.0	9.8	6.1
Polecat Cr	0.0	0.0	5.6	18.4	24.0	14.9
Quarter Cr	0.0	0.0	3.4	0.0	3.4	2.1
Second Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0
Sickle Cr[10]	0.0	0.0	0.0	2.0	2.0	1.2
Snake R[5, 9, 10]	11.4	12.0	14.0	49.6	101.0	62.8
Spread Cr	21.2	6.8	0.0	0.0	28.0	17.4
Spring Cr	0.0	5.0	0.0	0.0	5.0	3.1
Stewart Draw	0.0	5.3	0.0	0.0	5.3	3.3
Taggart Cr	0.0	5.6	0.0	0.0	5.6	3.5
S Fk Taggart Cr[8]	0.0	0.0	0.0	0.0	0.0	0.0
Third Cr	0.0	3.5	0.0	0.0	3.5	2.2
Topping Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 13 (Two Ocean Lake)	0.0	2.2	0.0	0.0	2.2	1.4

Stream	Survey Length (km) by Administrative Unit				Totals	
	BTNF	GTNP	JDR	YNP	km[4]	mi
Unnamed Tributary 14 (Emma Matilda Lake)[7]	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 16 (Laurel Lake)[7]	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 17 (Arizona Lake)	3.4	0.9	0.0	0.0	4.3	2.6
Unnamed Tributary 18 (Bearpaw Lake)	0.0	2.2	0.0	0.0	2.2	1.4
Unnamed Tributary 19 (Dudley Lake)[8]	0.0	0.0	0.0	0.0	0.0	0.0
Wallace Draw[7]	0.0	0.0	0.0	0.0	0.0	0.0
Waterfalls Canyon	0.0	4.6	0.0	0.0	4.6	2.8
Totals	182.9	251.3	41.2	112.5	590.9	367.2
Percent	31.0	42.5	7.0	19.0		
Number of Streams	16	43	5	8	53	

[1] CUT=unidentifiable cutthroat trout.
[2] CUT<150mm include young-of-the-year (<80mm), 1^+ (80-100mm), or fish >100mm that retain parr marks or lack distinct spotting pattern.
[3] CUT>150mm with spotting pattern that cannot be identified as YSC or SRC.
[4] Surveyed stream lengths do not include private lands. This summary includes only stream surveys funded with GYCC grant.
[5] Boat sampled with Wyoming Game and Fish Department. Gros Ventre River is GTNP and NER boundary.
[6] Hook-n-line sample on 2 reaches (3.65 km)
[7] Not sampled due to low flow or stream dry.
[8] Not sampled due to being upstream of 3 fishless sample reaches or habitat deemed unable to support fish.
[9] An additional 14 km sampled by WGFD during 2004 abundance sampling on either private or BLM lands.
[10] Surveyed in part or fully by Yellowstone National Park Fisheries Crew

Table 9 Summary by fish species of distribution surveys cooperatively funded by the Greater Yellowstone Coordinating Committee, National Park Service – Greater Yellowstone Network and Cooperative Conservation Initiative, from 2002-2004. See Table 10 for species abbreviations.

	Species[1] Presence (km)									
Streams Surveyed	CUT <150mm[2]	CUT ≥150mm[3]	SRC	YSC	BKT	BNT	GLD	LAT	RBT	RXC
Arizona Cr	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bailey Cr	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Beaver Cr	0.0	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
Berry Cr	6.0	8.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
Bradley Cr	0.5	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Brush Cr	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
Buffalo Fk[5]	0.0	10.0	24.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0
Cascade Cr	3.4	2.3	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0
Cascade Cr, S Fk	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
Christian Cr	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Cottonwood Cr	2.4	1.2	2.4	0.0	4.8	0.0	0.0	0.0	0.0	0.0
Colter Canyon	0.6	0.0	0.0	0.0	0.6	0.6	0.0	0.0	0.0	0.0
Coulter Cr[9]	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Crooked Cr[10]	8.6	2.8	0.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0
Death Canyon	6.6	4.4	1.1	0.0	5.5	0.0	0.0	0.0	0.0	0.0
Dime Cr[9]	2.8	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0
Ditch Cr	0.0	1.1	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Garnet Canyon	0.4	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Glacier Gulch	0.5	0.0	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0
Glade Cr[9]	4.2	0.0	0.0	0.0	4.2	0.0	0.0	0.0	0.0	0.0
Granite Cr	0.0	1.2	1.7	0.0	2.9	0.0	0.0	0.0	0.0	0.0

Streams Surveyed	Species[1] Presence (km)									
	CUT <150mm[2]	CUT ≥150mm[3]	SRC	YSC	BKT	BNT	GLD	LAT	RBT	RXC
M Fk Granite Cr[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N Fk Granite Cr[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S Fk Granite Cr[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gros Ventre R[5,6]	0.0	2.2	14.2	0.0	0.0	0.0	0.0	0.0	0.0	4.0
Hanging Canyon	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Harebell Cr[9]	7.7	1.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0
Heart River[10]	7.8	2.2	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0
Hechtman Cr	4.5	3.6	0.9	3.6	0.0	0.0	0.0	0.0	0.0	0.0
Lake Cr[6]	0.0	0.0	1.6	0.0	2.4	0.0	0.0	0.0	0.0	0.0
Lava Cr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Leigh Canyon	2.4	2.2	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Lizard Cr	3.6	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0
Lost Cr (Snake R)[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Cr (Topping Cr)[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moose Cr	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moran Cr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moran Cr, N Fk[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Moran Cr, S Fk[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nickel Cr[7,9]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
North Moran Cr	1.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
North Moran Cr, N FK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open Canyon	0.9	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0
Owl Cr	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Streams Surveyed	Species[1] Presence (km)									
	CUT <150mm[2]	CUT ≥150mm[3]	SRC	YSC	BKT	BNT	GLD	LAT	RBT	RXC
Pacific Cr	4.0	2.0	2.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0
Paintbrush Canyon	0.7	2.7	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0
Pilgrim Cr	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pilgrim Cr, E Fk	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Plateau Cr[9]	1.4	3.8	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Polecat Cr[9]	10.0	8.0	0.0	6.0	2.0	8.0	0.0	0.0	0.0	0.0
Quarter Cr[9]	1.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0
Second Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sickle Cr[10]	2.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Snake R[5, 10]	22.0	48.0	36.0	24.0	2.0	26.0	0.0	6.0	0.0	0.0
Spread Cr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spring Cr	0.0	0.0	0.3	0.0	2.1	0.0	0.0	0.0	0.0	0.0
Stewart Draw	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Taggart Cr	2.8	1.2	0.7	0.0	2.8	0.0	0.0	0.0	0.0	0.0
S Fk Taggart Cr[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Third Cr	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Topping Cr[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 13 (Two Ocean Lake)	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 14 (Emma Matilda Lake)[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 16 (Laurel Lake)[7]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Unnamed Tributary 17 (Arizona Lake)	0.9	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0

Streams Surveyed	Species[1] Presence (km)									
	CUT <150mm[2]	CUT ≥150mm[3]	SRC	YSC	BKT	BNT	GLD	LAT	RBT	RXC
Unnamed Tributary 18 (Bearpaw Lake)	1.2	0.0	0.4	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Unnamed Tributary 19 (Dudley Lake)[8]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wallace Draw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waterfalls Canyon	1.3	1.3	0.0	0.7	2.0	0.7	0.0	0.0	0.0	0.0
Totals	128.7	110.2	89.1	57.5	57.5	36.9	0.0	6.0	0.0	4.0
Percent	31.8	27.3	22.0	14.2	14.2	9.1	0.0	1.5	0.0	1.0
Number of Streams	38	21	16	12	26	6	0	1	0	2

[1] CUT=unidentifiable cutthroat trout.
[2] CUT<150mm include young-of-the-year (<80mm), 1^+ (80-100mm), or fish >100mm that retain parr marks or lack distinct spotting pattern.
[3] CUT>150mm with spotting pattern that cannot be identified as YSC or SRC.
[4] Surveyed stream lengths do not include private lands.
[5] Boat sampled with Wyoming Game and Fish Department. Gros Ventre River is GTNP and NER boundary.
[6] Hook-n-line sample on 2 reaches (3.65 km)
[7] Not sampled due to low flow or stream dry.
[8] Not sampled due to being upstream of 3 fishless sample reaches or habitat deemed unable to support fish.
[9] An additional 14 km sampled by WGFD during 2004 abundance sampling on either private or BLM lands.
[10] Surveyed in part or in full by Yellowstone National Park Fisheries Crew

Table 10 Common and scientific names[1] of fishes and amphibians in the Snake Headwaters basin of Wyoming, and species abbreviations as identified by the Wyoming Game and Fish Department.

Species ID	Common Name	Genus	Species	Subspecies	Native Drainage[2]	Game Fish
BHS	bluehead sucker	*Catostomus*	*discobolus*		1,4,7	N
BKT	brook trout	*Salvelinus*	*fontinalis*			Y
BNT	brown trout	*Salmo*	*trutta*			Y
BRC	Bonneville (Bear River) cutthroat trout	*Oncorhynchus*	*clarkii*	*utah*	9	Y
CRC	Colorado River cutthroat trout	*Oncorhynchus*	*clarkii*	*pleuriticus*	4,7	Y
CUT	cutthroat trout	*Oncorhynchus*	*clarkii*			Y
FHM	fathead minnow	*Pimephales*	*promelas*		2,3,5,6	N
GDT	golden trout	*Oncorhynchus*	*mykiss*	*aguabonita*		Y
GRL	grayling	*Thymallus*	*arcticus*		2	Y
GUP	guppy	*Poecilia*	*reticulata*			N
KOE	kokanee	*Oncorhynchus*	*nerka*			Y
LAT	lake trout	*Salvelinus*	*namaycush*			Y
LND	longnose dace	*Rhinichthys*	*cataractae*		1,2,3,5,6,8	N
LSC	leatherside chub	*Snyderichthys*	*copei*		1,9	N
MSC	mottled sculpin	*Cottus*	*bairdii*		1,4,7,9	N
MTS	mountain sucker	*Catostomus*	*platyrhynchus*		1,2,4,7,8,9	N
MWF	mountain whitefish	*Prosopium*	*williamsoni*		1,2,3,4,7,8,9	Y
NOD	No Data/Unknown					N
OOO	No fish Present					N
PSC	Paiute sculpin	*Cottus*	*beldingii*		1,9	N
RBT	rainbow trout	*Oncorhynchus*	*mykiss*			Y
RXC	cutbow (RBT x CUT)					Y
RSS	redside shiner	*Richardsonius*	*balteatus*		1,9	N
SPD	speckled dace	*Rhinichthys*	*osculus*		1,4,7,9	N
SPK	splake (BKT x LKT)					Y
SRC	finespotted Snake River cutthroat trout	*Oncorhynchus*	*clarkii*	*subspecies*	1	Y
TGT	tiger trout (BKT x BNT)					Y
TRT	any trout					Y
UTC	Utah chub	*Gila*	*atraria*		1,9	N
UTS	Utah sucker	*Catostomus*	*ardens*		1,9	N
YSC	Yellowstone cutthroat trout	*Oncorhynchus*	*clarkii*	*bouveri*	1,2,3,8	Y

[1] Sources included Nelson et. al. 2004. Baxter and Stone 1995, and Behnke 1992.

[2] Drainage Code: 1 - Snake River; 2 - Big Horn River, Shoshone River, Wind River; 3 - Powder River; 4 - Green River; 5 - North Platte River; 6 - Little Missouri River, Cheyenne River, Niobrara River, Belle Fouche River; 7 - Little Snake River; 8 - Yellowstone River; 9 - Bear River.